DOCUMENT RESUME

ED 213 183 EC 141 134

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TITLE The Use of Physical Exercise in the Modification of Ward Behavior in Institutionalized Hyperactive Boys: A Preliminary Investigation.
PUB DATE [78]
NOTE 19p.

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Behavior Change; Elementary Secondary Education; *Hyperactivity; Institutionalized Persons; *Physical Activities; *Running

ABSTRACT

The effects of a structured physical exercise program on the ward behavior of 16 institutionalized hyperactive children (6 to 13 years old) was investigated. Ss were randomly assigned to conditions in which they ran, engaged in calesthenics, or both, for 20 minutes per day, 5 days a week, for 4 weeks. Data from daily behavioral measures were analyzed and a large statistically significant beneficial effect for running was found. Calesthenics did not improve the children's daily scores. The possible contribution of physiological and psychological factors is considered. (Author/CL)

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THE USE OF PHYSICAL EXERCISE IN THE MODIFICATION OF WARD BEHAVIOR IN INSTITUTIONALIZED HYPERACTIVE BOYS; A PRELIMINARY INVESTIGATION

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Running Head: Exercise for Hyperactivity

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THE USE OF PHYSICAL EXERCISE IN THE MODIFICATION OF WARD BEHAVIOR IN INSTITUTIONALIZED HYPERACTIVE BOYS; A PRELIMINARY INVESTIGATION

SUMMARY

Improving management of inappropriate ward behavior in institutionalized hyperactive male children was attempted through structured exercise programs. The subjects were randomly assigned to conditions in which they ran, engaged in calisthenics, or both ran and performed calisthenics. The children exercised 20 minutes a day, 5 days a week, for 4 weeks. A control group was included which was not required to perform structured physical activities. The effects of the physical activity program was assessed by collecting each child's scores on a daily behavioral point sheet used by the hospital staff, and averaging the data over weeks. A Running X Calisthenics X Weeks analysis of variance performed on these data revealed a large, and statistically significant, beneficial effect for running. Calisthenics did not improve the children's daily scores.

A. INTRODUCTION

The intervention or treatment of hyperactivity has been focused upon medication, behavior modification techniques, or destimulating the environment (9). Medication remains the treatment of choice for the hyperactive child. However, there is growing concern over such an approach due to the risk of contributing to the drug culture by teaching the child to take pills as a way of solving his or her problems, the possible use of drugs for social control, and the lack of documented evidence about both the long-term effects and the immediate side effects of drugs (19). Behavior therapy research (1, 2, 15, 18) has shown encouraging results with managing hyperactive children, but the behavioral programs may be criticized for focusing only on discrete operants. Additionally, behavior therapies have not been shown to be superior to other forms of intervention in immediate outcome, duration of effect, or therapist time (19). The effectiveness of minimal stimulation programs (5) which require the elimination or modification of potentially distracting sources of environmental stimulation, has been seriously questioned in a number of studies (20, 21). The short-comings of the major treatment models call for a look at other methods.

A proposed alternative approach to treatment involves the use of physical exercise in controlling the heightened activity level and associated problems of hyperkinesis. Eisenberg (8)

advised that treatment of the hyperactive child should include structured physical activities to reduce anxiety and thus lower activity levels. Physical exercise has also been recommended by Edson (7), Kostrubala (cited in, 13), and McNamara (16). Indeed, several researchers (10, 17) have shown that participation in an exercise program does significantly reduce anxiety and tension.

Eisenberg (8) and Fine (9) recommended that treatment of hyperactive children include methods of improving poor self-concept. Several researchers (3, 10) have shown that participation in an exercise program does significantly contribute to positive self-image and self-acceptance. However, although Mauser and Williams (14) found significant increases in body coordination, there was little change in self-concept for children 4 to 12 years of age who participated in an eight week physical exercise program.

Cratty, Ikeda, Martin, Jennett, and Morriss (4) dismissed exercise as a technique to control hyperactivity, suggesting it might interfere with learning. Dyck (6) cautioned that the stimulation of physical activity is overwhelming to hyperactive children, and the reduction of the heightened activity level by this method was not recommended. However, there is little empirical evidence in support of these warnings.

The authors are aware of only one study which actually tested the hypothesis that physical exercise could be used in managing hyperactivity. Klein and Deffenbacher (11) explored the effec-

tiveness of large muscle exercise in improving the cognitive performance of hyperactive, impulsive, male children. The exercise program consisted of calisthenics for five, 20 minute sessions over a three week period. At the end of this period the exercise group performed significantly more accurately on the Matching Familiar Figures Test than did the untreated control group. Klein and Deffenbacher concluded that physical exercise is potentially effective in treating both hyperactivity and impulsivity.

The present study was designed to investigate the effects of two physical exercise programs (calisthenics and running) on the management of institutionalized hyperactive male children. Specifically, it was hypothesized that strenuous physical activity would help the children to "burn off" excessive energy and thus contribute to the maintenance of appropriate general ward behavior.

B. METHOD

1. Summary of Design

The study was based on a 2 X 2 X 4 factorial repeated measures design, with participation in running program, participation in calisthenics program, and weeks of participation as the independent variables. Participants were evaluated weekly by examing scores on a daily behavioral point sheet.

2. Subjects

The subjects were 16 male children who had been diagnosed by a

clinical child psychiatrist as exhibiting the "Hyperkinetic reaction of childhood 308.0" described in the Diagnostic and Statistical Manual of Mental Disorders, Second Edition (DSM-II). Ages ranged from 6 to 13 years. All were on a temporary commitment residence at the Children's Unit of the Wichita Falls State Hospital.

3. Procedure

Subjects were randomly assigned to the four experimental groups, thus resulting in four subjects for each group. The groups were not matched for age, length of residence, medical history, nor any other factors since it was assumed that the totally random assignment of subjects to conditions would roughly equalize the influence of such extraneous variables. Group 1 was involved in a running program for 20 minutes a day. Group 2 was engaged in a calisthenics exercise program for 20 minutes daily. Group 3 participated daily in both the running program for ten minutes and in the calisthenics program for ten minutes. Group 4 served as the control group and did not participate in either exercise program but had a period of free time on the playground for 20 minutes each day. The structured program was in operation Monday through Friday, for four weeks.

The running program (Group 1) was held outside at a cross-country track on the hospital grounds. Due to rainy weather the running program was conducted on an outside covered porch for one session. The running began each day after school at 3:10 PM and

continued until 3:30 PM. This children were asked to run without stopping for 20 minutes. When fatigued, they were allowed to walk until they recovered sufficiently to begin running once again. After the second week of running, however, all of the children in this group could run the entire 20 minutes without walking. The senior author ran with this group each session, verbally coaxing the subjects to continue.

The calisthenics program (Group 2) was conducted outside on the playground. This exercise group began at 5:40 PM and continued until 6 PM. Due to a tornado, one session in the second week had to be cancelled. Also, one session had to be conducted inside the building due to rainy weather. The children in this group were required to participate in all the exercises. These exercises included push-ups, sit-ups, leg raises, deep knee bends, sidestraddle hops, and various other stretching and/or conditioning anaerobic calisthenics. The senior author also led this group, verbally coaxing the boys to continue.

The children in the combined running and calisthenics program (Group 3) participated in the first ten minutes (3:10 PM - 3:20 PM) of the previously mentioned running program and also in the first ten minutes (5:40 PM - 5:50 PM) of the calisthenics program.

The control group (Group 4) did not participate in either exercise program but had a 20 minute free time session outside on the playground each day from 3:40 PM to 4 PM. These children were allowed to do as they wished (within reasonable limits) for the total session. The senior author also was with this group engaging

in normal verbal conversation. Rainy weather forced this group inside for one session.

4. Dependent Variable

The dependent variable collected was the individual child's daily score (averaged for each of the 4 weeks) on a behavioral check list used by the Children's Unit staff. Points were awarded for proper behavior on the ward and in school. The areas for which points were awarded involved the whole daily schedule of the children and included such things as getting up on time, dressing properly, keeping their rooms clean, proper behavior at meals, proper behavior at school, quiet times, proper behavior in lines, proper bathing behavior, proper group behavior, proper behavior at recreational activities, good job performance, going to bed when asked, and staying in bed properly. This list is not inclusive and many other areas were covered on the point sheet, all concerning appropriate behavior. The child care workers gave the children one point for proper behavior in each area. The maximum number of points a child could obtain in one day was 35. The child care workers were not aware that the children were participating in an experiment, having been told the exercise groups were being conducted solely for physical fitness purposes.

C. RESULTS

A Running (participation in the running program vs. no participation) X Calisthenics (participation in the calisthenics program

vs. no participation) X Weeks (1-4) analysis of variance was conducted with Weeks as the within-subjects factor and all other factors between-subjects. The daily score, averaged over weeks, of each subject on a behavioral point sheet was used as the dependent measure.

The predicted main effect of Running was significant: $F(1,12) = 12.25$, $p < .01$. The subjects who participated in the running program had a mean score of 27.40 while those subjects who did not run obtained an average daily score of 20.88. Results indicate that participation in the running program enabled the hyperactive child to obtain much higher daily scores on the point sheet, thus signifying more appropriate ward behaviors.

The analysis of variance also revealed a marginally significant main effect for Weeks, $F(3,36) = 3.28$, $p < .05$. As shown in Table 1, the average daily points for the children varied from the

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Insert Table 1 about here

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beginning of the program to the end. The lowest average points were recorded for the second week, the highest for week three, and weeks one and four intermediate. The low average for the second week is possibly attributable to an extremely destructive tornado which struck Wichita Falls on Tuesday of that week. Thousands of homes were destroyed, and the entire population was affected by power and water losses. Certainly this may have disrupted the behavior of the children in this study. However, post hoc compar-

isons of paired means using the Newman-Keuls stairstep method with $\alpha = .05$ revealed no statistically significant differences, nor did a Scheffe' test in which the mean score of week two was compared to the combined means of weeks one, three, and four indicate a statistically reliable effect. It seems probable that the marginal main effect of Weeks was due to a Type I error created by random chance fluxuations.

No other main effects or interactions were significant (all $F < 1.9$). This was surprising in that the predicted effect of calisthenics was not obtained, nor did exercise interact significantly with weeks.

D. DISCUSSION

Results support the original hypothesis that physical exercise can be used to facilitate the ward management of children displaying hyperactive behaviors. However the results also indicate that the type of exercise greatly determines the effectiveness of such procedures. Of the two physical exercise programs studied in the present experiment, only running contributed to significantly higher scores on the behavioral check list, thus indicating more appropriate behaviors. Participation in the calisthenics program was ineffective.

Interestingly, running began to have a positive effect on the participating children immediately. Almost instantly, the eight children in the two exercise programs which included running achieved and maintained reliably higher scores on the behavioral

checklist than did nonrunners. With the absence of pretest scores from the subjects of this experiment, a problem in interpreting this finding becomes apparent. We originally had anticipated significant interactions of exercise and weeks of participation, indicating linearly increasing scores for the exercise groups, unchanging behavior for the control subjects. Although the main effect of running was significant, the Running X Weeks interaction was not. The failure to obtain the significant interaction possibly reflects differences in initial assignment of participants to conditions rather than the influence of the independent variable. Since pretest scores were not available, this could not be investigated directly. However, two arguments against this explanation may be suggested. First, the significance and direction of the effect of running has been hypothesized a priori. With the random assignment of subjects to groups, unidirectional differences such as those obtained would be expected by chance less than 1 time in 40. Second, a Running X Calisthenics analysis of variance on the children's scores collected on the first day of training revealed no reliable effects of exercise.

The success of running in contributing to appropriate ward behavior in hyperactive children could be the result of physiological factors, psychological factors, or a combination of the two.

Physiological factors which may be involved include all the biochemical and physiological changes in the body brought about by the physical exertion of running. One such beneficial physiological change would be increased circulation of blood to the brain, thus

increasing the nutrients, hormones, and various other biochemicals necessary for proper functioning. An alternative physiological theory is that running reduces heightened tension by partial fatigue, thus consuming energy and resulting in a lower activity level and increased attentiveness. Kostrubala (12) suggested still another possibility——running is therapeutic because it stimulates lower, more primitive brain centers. This latter hypothesis is based on the assumption that mankind has been running for over three million years and only recently has become sedentary.

Psychological factors which may be involved include the increase in self-esteem and self-acceptance brought about by the sense of accomplishment, independence, and control over one's body gained by being physically fit and by having successfully overcome the pain and physical hardships of running.

The question arises as to why running is beneficial in controlling hyperactivity while another form of physical exercise, calisthenics, is not. Possible explanations include: running is a more strenuous form of exercise affecting many more areas of the body; running allows for a much greater sense of accomplishment; and running is less structured, therefore more appealing.

A running program can be conducted almost anywhere. This type of program requires very little equipment and would therefore be affordable to anyone. No specially trained therapist is needed to conduct the program, and there are no special skills required of the participants.

The suggestion that a simple running program can be used to facilitate the management of hyperactive children seems appealing. Its implications to applied psychology should merit future research.

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FOOTNOTE

[1] Reprints are available from the second author at the Department of Psychology, Midwestern State University, Wichita Falls, Texas 76308.

Table 1

Mean Scores, Averaged For Weeks, On The Daily Ward Behavioral Check List

Group	Weeks 1	2	3	4	Group M
Running & Calisthenics	26.85	25.70	28.30	25.20	26.51
Running only	27.85	26.95	30.35	28.00	28.29
Calisthenics only	21.65	16.75	21.20	20.55	20.04
Control	22.20	22.35	21.10	21.25	21.73
Week M	24.64	22.94	25.24	23.75	24.14

Note. Maximum score = 35.00